(1) Federal Register notice containing the designation of HCBD to the Priority List.

(2) Public comments on the ITC report.

(3) Communications (public, intra-agency, and interagency) consisting of memoranda and letters, contact reports of telephone conversations, and meetings.

(4) Published and unpublished data.

The Agency will supplement the record with additional relevant informaiton as it is received.

(Sec. 4, 90 Stat. 2003; (15 U.S.C. 2061))

Dated: December 20, 1982.

Anne M. Gorsuch,

Administrator.

[FR Doc. 82-35273 Filed 12-23-82; 4:12 pm]

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[OPTS-42014; TSH-FRL 2234-4]

Pyridine; Response to the Interagency Testing Committee

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: This notice is EPA's response to the Interagency Testing Committee (ITC) designation of pyridine for consideration for health and environmental effects testing under section 4(a) of the Toxic Substances Control Act (TSCA). EPA has decided not to initiate rulemaking to require testing of pyridine under section 4(a) of TSCA for carcinogenicity, chronic effects, or environmental effects. EPA has concluded that sufficient data have been or are being developed on pyridine for carcinogenicity and chronic effects by the National Toxicology Program. EPA is not initiating rulemaking to require testing of pyridine for environmental effects because the Agency has found no evidence of substantial environmental release of pyridine and, because pyridine is not likely to persist or bioaccumulate, no reason to believe pyridine may present an unreasonable risk to the environment. EPA has made tentative decisions not to initiate rulemaking to require testing of pyridine for mutagenicity, teratogenicity, or neurotoxicity at this time. Considering the numbers of people exposed, the probable levels of exposure, and the nature of existing data, the Agency has concluded that a finding that pyridine may present an unreasonable risk for these effects is not warranted. Because of the difficult nature of the issues involved, EPA is soliciting comment and submission of any additional data relevant to the Agency's tentative decisions.

DATES: Submit written comments on or before February 14, 1983.

ADDRESS: Written comments should bear the document control number OPTS-42014 and should be submitted in tripicate to: Document Control Officer, Management Support Division (TS-793), Office of Pesticides and Toxic Substances, Environmental Protection Agency, Rm. E-401, 401 M St. SW., Washington, DC 20460.

FOR FURTHER INFORMATION CONTACT: Douglas G. Bannerman, Acting Director, Industry Assistance Office (TS-799), Office of Toxic Substances, Environmental Protection Agency, Rm. E-511, 401 M St. SW., Washington, DC 20460, Toll Free: (800-424-9065), in Washington, DC (554-1404), outside the USA: (Operator 202-554-1404).

SUPPLEMENTARY INFORMATION:

I. Background

Section 4(e) of TSCA [Pub. L. 94-469, 90 Stat. 2003; 15 U.S.C. 2601 *et seq.*] established an Interagency Testing Committee (ITC) to recommend a list of chemicals for EPA to consider for promulgation of testing rules under section 4(a) of the Act. The ITC designated pyridine for testing in its Second Report, published in the **Federal Register** of April 19, 1978 (43 FR 16684), and recommended that pyridine be evaluated for: (1) Carcinogenicity, (2) mutagenicity, (3) teratogenicity, (4) other chronic effects on the liver, kidney and central nervous system, (5) environmental effects, and (6) epidemiology.

The basis for the ITC recommendations was that: (1) Sixty million pounds of pyridine were reported to be produced in 1976, (2) the National Institute for Occupational Safety and Health (NIOSH) estimated that 249,000 persons might be exposed to pyridine, and (3) there was a paucity of data and a lack of long-term tests on the effects of pyridine on human health and the environment.

This notice is EPA's response to the ITC designation of pyridine for testing.

II. Decisions Not To Initiate Rulemaking

The Agency is not initiating rulemaking to require testing of pyridine for carcinogenicity and for chronic effects on the liver and kidney because a subchronic test and an oncogenicity bioassay using rats and mice have been conducted by the National Toxicology Program (NTP). The animals from the bioassay were sacrificed in January, 1982, and the results will be available for review in 1983. It is expected that these tests will prove adequate to determine pyridine's oncogenicity and its chronic effects on the liver and kidney.

EPA is not initiating rulemaking to require testing of pyridine for chronic environmental effects because the Agency has found no evidence of substantial environmental release of pyridine and no reason to believe that pyridine may present an unreasonable risk to the environment. The present pattern of use of pyridine appears to preclude substantial release of pyridine. Of the less than 26 million pounds (12 million kilograms) of pyridine produced in the U.S. each year, approximately half is exported (Ref. 34). Up to 80 percent of the remaining pyridine is converted into other chemicals, i.e., agricultural chemicals, such as herbicides and insecticides, pharmaceuticals, and chemicals such as piperidine for use in the rubber industry (Ref. 34).

Most of the residual 20 percent of the pyridine used in the U.S. is used as a reaction solvent in chemical manufacturing or as a component of the Karl Fischer reagent in laboratories. Because of the high cost of pyridine, the chemical is recovered and recycled when used as a chemical solvent. In the Karl Fischer reaction, the pyridine is fully spent in the reaction. The pyridine industry reported that in 1977, 660,000 pounds of pyridine were disposed of, half of it via publicly owned treatment works (Ref. 34). Because this figure does not distinguish between input into treatment systems and ultimate environmental release, ultimate environmental release of pyridine is likely to be lower than this figure indicates. There are limited data on pyridine being present in industrial effluents (Ref. 38), in aqueous effluents from coke-oven quenching operations at 11 ppm (Ref. 10) and from coal gasification operations in the range of 0.1 to 0.2 ppm (Ref. 33). No reports were found in the EPA STORET data base on the presence of pyridine in ambient waters.

In addition, pyridine is not likely to be persistent in the environment because it has been shown to be readily metabolized by several microorganisms (Refs. 8, 12, 16, 17, 39 through 42, and 45). Based upon its physicochemical properties, pyridine is also not expected to bioaccumulate (Ref. 25). The octanol/water partition coefficient for pyridine is quite low, i.e., log P=0.65 (Ref. 25). Because pyridine is not likely to persist in the environment and is not likely to bioaccumulate, EPA finds no basis to believe that there is a potential for long-term exposure to pyridine in the

environment and thus no reason to believe that pyridine may present an unreasonable risk of chronic toxicity to the environment. Acute toxic data noted in aquatic and terrestrial organisms reveals that, overall, pyridine is toxic only at high levels of exposure and such levels are not likely to occur in the environment (Refs. 2 through 7, 9, 20, 24, 27, and 44).

Finally, EPA is not initiating rulemaking to require an epidemiological study of pyridine because a suitable cohort has not been identified with a sufficiently large number of workers who are routinely exposed to pyridine to make such a study meaningful.

III. Tentative Decisions Not to Initiate Rulemaking

EPA has tentatively decided not to initiate rulemaking to require mutagenicity, teratogenicity, or neurotoxicity testing of pyridine because the Agency believes that human exposure to pyridine is not substantial or significant and because there is insufficient basis to find that pyridine may present an unreasonable risk for these effects. With respect to mutagenicity, some mutagenicity data have become available since the ITC's designation of pyridine. These data, although incomplete, do not indicate that pyridine is likely to be mutagenic.

EPA's decisions not to initiate rulemaking to require testing to determine pyridine's potential to cause teratogenic effects and effects on the central nervous system have required substantially more difficult judgments than the Agency's decisions with respect to the other effects for which the ITC recommended testing. Existing data indicate that pyridine might have the potential to cause teratogenic or neurotoxic effects and the recently completed chronic testing by the NTP is not expected to resolve this uncertainty. Nevertheless, after carefully considering the existing evidence for such effects and the available evidence concerning human exposure to pyridine, the Agency believes that it cannot reasonably make the findings necessary to require the testing of pyridine under section 4(a) of TSCA. The information considered by EPA and the basis of its judgment not to initiate rulemaking are explained more fully below.

A. Information on Exposure

Various factors lead EPA to believe that human exposure to pyridine is much less than the ITC had reported, and is not substantial or significant. As already reported above, of the 26 million pounds of pyridine produced per year, approximately half is exported, up to 80 percent of the remaining pyridine is converted into other chemicals, and most of the residual 20 percent is used as a reaction solvent in chemical manufacturing or as a component of the Karl Fischer reagent in laboratories. In the past, pyridine was used in the textile industry. This use has been phased out due to the high cost and unpleasant odor of pyridine, however. Pyridine is also created as a by-product during coke-oven (Ref. 30) and coal gasification operations (Ref. 33).

Human exposure to pyridine appears to be confined largely to the laboratory, coke-oven, and manufacturing and processing environments. Based on actual observed use of pyridine in its 1972 to 1974 survey, NIOSH observed 903 persons exposed to pyridine (Ref. 29) and estimated that 29,285±12,000 persons could be exposed to pyridine (Ref. 28). This survey did not consider exposure from coke-ovens. The occupational categories listed for 88.7 percent of the estimated workers were laboratories (agricultural, biological, and chemical) (Ref. 28).

A collective response from the manufacturers of pyridine accurately herein referred to as the Pyridine Task Force (PTF), estimated that 30,000 laboratory workers could be exposed to pyridine annually, which is roughly consistent with the NIOSH estimate (Ref. 34). However, while laboratory use of Karl Fischer reagent appears to be the most dispersive of the uses of pyridine, there is reason to believe that actual exposure is quite low (Refs. 35 and 36). Both pyridine's noxious odor and the nature of its use require that the chemical be handled in closed systems and ventilated hoods. The Karl Fischer reagent, which is used for analytical moisture determinations, is prepackaged and automatically dispensed in a closed, anhydrous system. Because leaks in the system sufficient to lead to human exposure would be sufficient to invalidate the testing due to moisture contamination, there is reason to believe that precautions are taken to avoid such leaks (Refs. 35 and 36). The pyridine is fully converted in the reaction to the hydroiodide salt of pyridine which does not volatilize. The spent solution automatically empties into a waste collection bottle in a ventilated hood. EPA believes therefore that exposures to pyridine through this use, if they occur, will be infrequent and at quite low levels. In recent monitoring of laboratory technicians working with pyridine in laboratories of one of the pyridine manufacturers, the highest concentration measured over a 6-hour period was 0.09 ppm time weighted average (TWA) (Ref. 37). Because pyridine usage in these quality control and research and development laboratories is believed to be far heavier than in any other type of laboratory, EPA believes exposure levels in other laboratories are generally lower.

With regard to possible exposure as a result of coke-oven emissions, a study conducted for OSHA estimated that 30,000 persons may be exposed annually (Ref. 14). Because other components of coke-oven emissions were determined to pose a significant risk of cancer to coke-oven workers, OSHA has set a Permissible Exposure Limit (PEL) of 150 $\mu g/m^3$ for these emissions, measured as the benzene-soluble fraction of total particulate matter (BSFTPM), averaged over an 8-hour period (Ref. 30). The PTF calculated that 33 pounds of BSFTPM occur in 10,000 cubic feet of gas released from coke ovens, and that 0.1 pound of pyridine could be present in the same volume of gas (Ref. 34). Based on this ratio of 330 BSFTPM to 1 of pyridine, a worker exposed to the PEL of 150 μg BSFTPM/m^3 would be exposed to approximately 0.5 μg pyridine/m^3 (Ref. 34).

On the basis of a questionnaire sent by the PTF to the major manufacturers and users of pyridine, the PTF reported that 813 persons were occupationally exposed to pyridine during its manufacture and first tier use (presumably as synthetic intermediate) (Ref. 34). Of these, 557 persons were reported to be exposed to pyridine for no longer than a period of 8 hours during a typical work week (Ref. 34). The current OSHA PEL for pyridine is 5 ppm (15mg/m^3) averaged over an 8 hour work shift (8-hr TWA) (Ref. 31). The PTF reported that 0.008–1.0 ppm pyridine (8-hr TWA) was present in the workplaces they monitored (Ref. 34).

In addition, pyridine possesses a penetrating noxious odor with a human odor threshold as low as 0.12 ppm (Ref. 35). Although olfactory fatigue does occur following human exposure to pyridine, a definite taste remains (Ref. 31). For this reason, OSHA lists pyridine as having good warning properties (Ref. 31). In spite of its long history of use, it has been cited that pyridine has a remarkable accident-free history (Ref. 32).

B. Information on Effects

1. *Teratogenicity.* On the basis of three teratogenicity studies, one in the chick embryo and two in the African Clawed Frog (*Xenopus laevis*), it appears possible that pyridine may possess teratogenic activity. The effects noted in both the chick embryo and the

African Clawed Frog studies occurred at quite high levels of exposure (Refs. 13, 15, and 23). No mammalian studies are available.

In the chick embryo study, muscular hypoplasia was observed when pyridine was injected at 10 mg/egg and 20 mg/egg but not at 5 mg/egg. Abnormal beaks and short and twisted necks were also observed among some embryos at the 20 mg/egg dose level. At the highest level tested (40 mg pyridine/egg) only 1 of the 85 embryos escaped early death. Muscular hypoplasia and a shortened upper beak were observed in the one surviving embryo (Ref. 23).

The first study in the African Clawed Frog exposed embryos at the early cleavage to mid-blastula stage of development to pyridine. Abnormalities (inability of embryos to develop into free swimming larvae) were produced in six percent of embryos after 48 hours of exposure to pyridine at 10 mg/L and in 33 percent of embryos after exposure at 50 mg/L (Ref. 13).

In the second study in the African Clawed Frog, the 96-hour EC_{50} value for pyridine to embryos in the mid-blastula stage development was 1200 mg/L. Acridine, quinoline, and aniline yielded 96 hour EC_{50} values of 2.4, 29, and 370 mg/L respectively. Similar abnormalities were noted for the four chemicals tested. They consisted of exogastrulation, edma, and formation of blisters on both dorsal and ventral surfaces, particularly in the head and anterior abdominal regions. The 96-hour LC_{50} values for acridine, quinoline, aniline, and pyridine to free-swimming larvae were 4.5, 95, 150, and 1,090 mg/L respectively. The authors of the study concluded that the data suggest that acridine, aniline, and quinoline have toxic and teratogenic effects at sufficiently low concentrations as to make them potential environmental hazards. No such conclusion was made for pyridine (Ref. 15).

The significance of these results and how they relate to humans are uncertain. The chick embryo test uses an a typical route of exposure while in the African Clawed Frog study high levels of exposure were needed to obtain effects that were statistically valid. EPA believes the data raise the level of concern as to the teratogenic of pyridine. However, the Agency also believes that the data, at best, are only weakly suggestive of teratogenic activity.

2. *Neurotoxicity.* Pyridine has been characterized as a general depressant similar to hypnosedatives such as phenobarbital (Ref. 26). Studies have indicated possible central nervous system effects (Refs. 21 and 26). Short of lethal doses, in no instance was permanency of effects noted. Human case histories of exposure to pyridine suggest possible central nervous system impairment from chronic exposures to the chemical (Ref. 43). With the exception of one case of acute exposure (Ref. 22), the case histories reported could be traced to chronic exposure to pyridine at quite high concentrations due to the lack of occupational hygiene and safeguards (Ref. 43). However, because of the high levels of exposure at which effects were elicited, the significance of these results is uncertain. The Agency has no evidence that exposure to pyridine currently is occurring at the levels at which central nervous system effects were reported, or that effects are likely to be seen at lower levels.

3. *Mutagenicity.* Based on data which have become available since the ITC made its recommendation, the Agency believes that the available data indicate that pyridine is likely to be nonmutagenic and thus that there is insufficient basis for a finding that pyridine may present an unreasonable risk from this effect. Pyridine was shown to be negative in the Ames Test with and without microsomal activation (Refs. 11 and 18). While pyridine induced a small but significant increase in sister chromatid exchange in cultured cells of the Chinese Hamster, a dose effect was not shown (Ref. 1). Chromosomal aberrations in the Chinese Hamster cells did not occur even when doses of pyridine were elevated to near lethal concentrations, where no cell mitosis was observed (Ref. 19).

C. Discussion of Decisions and Request for Comment

Under section 4(a) of TSCA, EPA can require testing of a chemical substance or mixture if, along with other findings, the Agency finds that (a) the manufacture, distribution in commerce, processing, use, or disposal of the substance or mixture may present an unreasonable risk of injury to health or the environment (section 4(a)(1)(A)) or (b) the substance or mixture is or will be produced in substantial quantities and (I) it enters or reasonably may be anticipated to enter the environment in substantial quantities or (II) there is or may be significant or substantial human exposure to the substance or mixture (section 4(a)(1)(B)).

Although the current production volume of pyridine may be regarded as substantial, EPA believes that the available information on its expected release to the environment and human exposure do not provide a basis for requiring testing under section 4(a)(1)(B). Pyridine should not be considered to be released to the environment in substantial quantities because it is rapidly biodegraded by soil and water microorganisms, and half of the estimated annual release of approximately 660,000 pounds is to publically owned treatment works where its degradation by microorganisms is expected (Refs. 8, 12, 16, 17, 34, 39 through 42, and 45).

While the legislative history of section 4 of TSCA indicates the types of factors EPA should take into account in making a finding of substantial human exposure (including number of persons, duration, and level of exposure), neither it nor the statute gives explicit guidance as to when exposure should be considered "substantial." There is also no discussion of the factors for determining that exposures are "significant." EPA has not proposed any quantitative criteria for making those determinations, but has instead approached the issue on a case-by-case basis.

With respect to pyridine, EPA has concluded that although coke-oven workers and certain laboratory personnel are exposed to pyridine, the levels and duration are too low to support a finding of substantial human exposure. Current data cannot provide absolute assurance that pyridine or another chemical could not present a risk at these exposure levels, but EPA believes that exposure of this number of persons at these levels is not so great as to raise the inherent concern over the possible effects of a chemical that section 4(a)(1)(B) was intended to address. Such exposure levels could be considered substantial if a larger number of persons were exposed, however. Data available to EPA indicate that smaller numbers of workers in manufacture and first tier use of pyridine may be exposed to higher levels of pyridine (Ref. 34). However, EPA does not believe that a substantial exposure finding is warranted due to the low number of persons involved. Finally, EPA believes that the currently available data provide no basis to expect that any of these exposures are likely to be great enough to be of clear biological significance, especially given the strong odor of pyridine which can be expected to strongly limit the levels and durations of such exposures.

Because EPA concluded that human exposure to pyridine is not sufficient to be judged substantial or significant in the context of section 4(a)(1)(B), the Agency evaluated the question of whether testing of pyridine should be required under the criteria of section

4(a)(1)(A). In order to make a finding that the chemical "may present an unreasonable risk to human health," the Agency must possess some evidence which suggests that the chemical has the potential to induce a health effect. In addition, the Agency must have a basis for believing that there is human exposure to the substance at a level which might pose a risk. Although the data discussed in unit III.B above indicate that pyridine may have a potential to cause teratogenic, neurotoxic, and mutagenic effects, EPA believes that a finding that pyridine may present an unreasonable risk from these effects is not justified considering the evidently low exposure to this substance and the lack of strongly suggestive data.

EPA has not to date attempted to articulate generally applicable criteria for the degree of likelihood that a chemical will cause an effect at anticipated human exposure levels, or the minimum levels of exposure, necessary to support a finding that a chemical may present an unreasonable risk. However, the Agency has generally recognized that there is an inverse relationship between the degree of concern about the potential hazard of a chemical (both its nature and likelihood) and the degree of exposure which would warrant testing. That is, the more severe and likely the potential health effect, the less exposure is necessary to conclude that there is sufficient concern to justify testing, and vice versa.

In this case, the data suggesting that pyridine may be teratogenic are only weakly suggestive. Available data indicate that neurotoxicity in humans follows only prolonged exposure to the chemical at high levels (Ref. 43). Data on mutagenicity indicate that pyridine is likely to be nonmutagenic (Refs. 1, 11, 18, and 19). In addition, the available information indicates that the limited uses and strong, disagreeable odor of pyridine can be expected to restrict human exposure to the substance to low concentrations and infrequent exposures (Refs. 31, 34, 35, 36, and 37). The Agency cannot conclude on the basis of this evidence that the chemical presents no risk to humans from these effects; however, it is the Agency's judgment that a significant risk of such effects is unlikely. Therefore, the Agency does not believe that a finding that pyridine may present an unreasonable risk to humans of teratogenicity, neurotoxicity or mutagenicity should be made.

EPA's decisions not to require testing of pyridine for teratogenicity, neurotoxicity, and mutagenicity are close ones. Therefore, the Agency encourages public comment on this issue, including the submission of any data different from or in addition to those discussed in this notice. If comments indicate to the Agency that exposures occur at significantly higher levels than available evidence indicates, or that there is a significantly stronger basis for believing that pyridine may present a hazard from teratogenic, neurotoxic, or mutagenic effects at levels to which humans may be exposed, the Agency will reconsider its decisions in this matter.

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V. Public Record

EPA has established a public record for this testing decision on pyridine (docket number OPTS–42014) which is available for inspection in the OPTS Reading Room from 8:00 a.m. to 4:00 p.m. on working days in Rm. E–107, 401 M St. SW., Washington, DC 20460. This record includes basic information considered by the agency in developing this decision, such as:

(1) Federal Register notice containing the ITC Report designating pyridine to the Priority List.

(2) Public comments on the ITC Report.

(3) Communications (public, intraagency, and interagency) consisting of memoranda and letters, contact reports of telephone conversations, and meetings.

(4) Published and unpublished data.

The Agency will supplement the record with additional relevant information as it is received.

(Sec. 4, 90 Stat. 2003; (15 U.S.C. 2061))

Dated December 20, 1982.

Anne M. Gorsuch,

Administrator.

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